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(54) Nylon-based composition of matter, plastics films comprising a layer of same, and packages made from such plastics films.

(57) The nylon-based composition is a blend or copolymer of nylon 6 and another nylon, e.g. nylon 66 or nylon 12, the latter being 2.5 to 10 mole percent of the overall composition. The blend can be 40 to 70 weight percent nylon 6 and 60 to 25 weight percent of a nylon copolymer which consists of 80 to 90% nylon 6 and 20 to 10% of the other nylon. A packaging film, (10) can have a first layer (18) of the said composition, a second layer (12) of a heat-sealable polymer such as low density polyethylene, a third, gas barrier layer (16) e.g. of ethylene vinyl alcohol copolymer and a fourth layer (14) between the second and third layers, the latter layer for instance being an ethylenic polymer or copolymer. The packaging film can be used for packaging moist products such as meat.

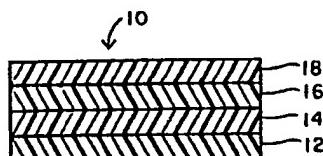


FIG. 1

EP 0 170 385 A1

"NYLON-BASED COMPOSITION OF MATTER, PLASTICS FILMS  
COMPRISING A LAYER OF SAME, AND PACKAGES MADE FROM  
SUCH PLASTICS FILMS"

The invention is concerned with polymers and  
5 polymer films which pertain particularly to packaging  
products in flexible packaging films. The packages  
are of the type having an inner heat sealable layer  
and an outer abuse resistant layer of nylon. A variety  
of these films is available commercially. Exemplary  
10 of such films are the structures

Nylon  
EVOH  
Plexar  
Surlyn

and

Nylon  
Plexar  
Surlyn

15 "Surlyn" and "Plexar" are Registered Trade Marks.

The four layer structure has an inner heat sealable  
layer of Surlyn, an outer abuse and heat resistant  
layer of nylon, and an internal gas barrier layer of  
ethylene vinyl alcohol copolymer (EVOH). The Plexar  
20 layer serves as an adhesive between the EVOH and  
Surlyn layers.

The three layer structure merely omits the  
EVOH gas barrier layer for uses where the products  
do not require high levels of protection against  
25 ingress of gases.

Films of this nature are generally formed by multiple layer coextrusion wherein it is desirable to select the polymer compositions for the individual layers such that their rheological properties are 5 conducive to intimate and simultaneous parallel melt flows in the coextrusion process.

Conventional films available commercially have generally used nylon 6 for the nylon layer. Nylon 6, however, presents processing problems in the 10 manufacture of the film, because the high amount of heat required for processing this nylon into film contributes to degradation of other polymers in the film, such as EVOH. Thus special provisions are desired to provide for the co-existent extrusion conditions necessary 15 to coextrude the film; and indeed certain process parameters are precluded by these special provisions.

This problem is addressed in JP-A-58/74,313 filed May 4, 1983, by Sumitomo Bakelite. A coextruded multiple layer film is disclosed therein of the nature 20

nylon  
EVOH  
adhesive  
Surlyn

where the nylon is specified as a copolymer which is 80% to 90% nylon 6 and 10% to 20% nylon 66 25 (percentages by weight). The patent specification.

specifies that the melting point of the nylon copolymer is close to that of the EVOH polymer. Since the melting point of the nylon copolymer is close to the melting point of the EVOH polymer, the major problems 5 of forming the film are thus resolved.

Films of the type disclosed in JP-A-58/74,313, however, are limited in their capacity for further heat processing. In heat sealing processes, and in thermoforming processes, the thermal operating ranges 10 which yield acceptable results in the finished package are too narrow to be easily sustained over extended periods with commercially available controllers. For example, in the heat sealing process, while the nylon copolymer has a lower softening and extrusion 15 processing temperature, as compared to nylon 6, which is conducive to coextrusion with EVOH, that same lower processing temperature creates problems in closing the package by heat sealing. A heat flux that normally would be used with structures having nylon 6 as the 20 outer layer is too high for the nylon copolymer, and the film may be burned through. Another problem associated with the quantity of heat flux required for heat sealing is that the nylon copolymer may soften and adhere to the sealing bar. Jamming of 25 packaging machinery can then result. This problem may,

at times, be corrected by reducing the amount of heat applied to the nylon layer by the sealing bars. In those cases where the problem may be corrected by reducing the heat applied, the film must spend more 5 time in contact with the sealing bar, thus creating an economic penalty by the resulting slower line speed.

Thus there exists a need for a polymer composition that would have a beneficial combination of the properties of low temperature extrusion processability 10 and high heat resistance for heat sealing operations.

It is an object of this invention to provide nylon compositions which are suitable for low temperature extrusion, and desirably are readily compatible with coextrusion with EVOH, and at the same time are 15 capable of withstanding the high heat sealing temperatures normally associated with nylon 6.

Another object is to provide single-layer films of nylon which have a high heat stability, like nylon 6, but have a lower temperature extrusion processability 20 than nylon 6, while having a high capacity for responding to heat useful for fabrication processes.

The invention also aims to provide a multiple layer film having nylon on one surface and a heat seal layer on the other surface, wherein the nylon has the high 25 heat resistance characteristics of nylon 6 but exhibits

lower extrusion processing temperatures than nylon 6.

According to one aspect of the present invention, there is provided a composition of matter which is a blend of 40% to 75% by weight nylon 6, and 60% to 5 25% by weight of a nylon copolymer wherein the copolymer is 80 to 90 mole percent moieties of a first polymer of nylon 6 and 20 to 10 mole percent moieties of a second polymer of nylon, the overall composition of the blend comprising 2.5 to 10 mole percent of the second 10 nylon polymer. Preferably, the overall blend composition is 5% to 7.5% moieties of the second nylon polymer.

The invention comprehends a plastics film comprising the above defined blend composition.

15 Further according to the invention, there is a multiple layer film having a heat sealable layer on one surface and a nylon layer on the other surface, and the composition of the nylon layer being a blend of 40% to 75% by weight nylon 6 and 60% to 25% by weight 20 of a nylon copolymer, wherein the copolymer is 80 to 90 mole percent moieties of a first polymer of nylon 6 and 20 to 10 mole percent moieties of a second polymer of nylon; the overall composition of the nylon blend comprising 2.5 to 10 mole percent moieties of the 25 second polymer of nylon.

A preferred multiple layer heat sealable film according to the invention comprises a first heat sealable layer on one surface of the film, a second nylon layer on the other surface of the film, a  
5 third layer of ethylene vinyl alcohol copolymer between the first and second layers and a fourth, adhesive layer between the first and third layers. The second layer is a blend of nylon polymers and copolymers, the blend being a composition as defined hereinabove. Once  
10 more most desirably the overall composition of the nylon copolymer in the second layer is 5 to 7.5 mole percent.

This multiple layer film can be modified by the inclusion of a further layer interposed between the second  
15 and third layers, the further layer for instance being a polyolefin.

In yet another preferred embodiment, the multiple layer film has an additional polymeric layer disposed between the first and fourth layers, e.g. a polymer or  
20 copolymer of polypropylene or polyethylene. This additional layer may be present with or without the earlier-iterated further layer. Where the further layer is not present, and the additional layer is present, there may be as few as five layers making up  
25 the film. The further layer may be present in the film

without the additional layer being present.

The second polymer of nylon can be nylon 66 or nylon 12, and can be present as 5.0 to 5.5 mole percent of the overall blend composition.

5 In another preferred blend, the second polymer of nylon comprises nylon 66 or nylon 12, and is present as 7.25 to 7.75 mole percent of the overall blend composition.

The invention further comprehends a package,  
10 including a containing packaging film and a moist product therein, the package being suitable for use in a moist environment, and being susceptible of being closed by heat sealing, characterised in that the packaging film has a first, heat sealable surface  
15 layer on that surface of the film disposed toward the interior of the package and a second, nylon surface layer on the surface of the film disposed toward the exterior of the package, the film further having a third layer of ethylene vinyl alcohol copolymer between  
20 the first and second layers, and a fourth layer of ethylene polymer or copolymer between the first and third layers and wherein the said second layer comprises a blend of 40% to 75% by weight nylon 6, and 60% to 25% by weight of a nylon copolymer wherein the copolymer is  
25 80% to 90% moieties of nylon 6 and 20% to 10% moieties

of a second nylon polymer; the overall composition of the blend comprising 2.5% to 10% moieties of the second nylon polymer. The function of the fourth layer between the first and third layers is normally to adhere 5 the adjoining layers together. A fifth layer of polypropylene or polyethylene may be disposed between the second and third layers, such that the fourth and fifth layers are each interposed between the ethylene vinyl alcohol layer and a respective one of the first 10 and second surface layers.

It has been found that most desirably in the overall composition the second nylon polymer in the second layer comprises 5 to 7.5 mole percent of nylon 66 or nylon 12.

15 The composition of the second layer may alternatively be comprised of an unblended nylon copolymer wherein the copolymer is 90 to 97.5 mole percent nylon 6 and 10 to 2.5 mole percent of a second polymer of nylon. Nylon 66 and nylon 12 are preferred for the second polymer 20 of nylon, though other nylons are operable.

The invention will now be explained in more detail in the following description of preferred embodiments, and is given by way of example only. The description is to be read in conjunction with the accompanying 25 drawings, in which:

Figs. 1, 1A, 2 and 2A are schematic cross-sectional views through four, five and six layer films according to the invention, and

- Fig. 3 schematically illustrates ranges of heat  
5 settings applicable to the thermoforming of  
(a) films according to the invention and (b) other  
thermoformable films.

The primary consideration of the invention  
resides in the blending of nylon polymers to achieve  
10 an improved and unexpected combination of properties in  
a heat sealable packaging film.

In its simplest form, the invention is a  
composition of matter which is an intimate and  
compatible blend of (i) nylon 6 and (ii) a copolymer  
15 of nylon 6 with a second nylon-type polymer, preferably  
nylon 66 or nylon 12, although other nylon polymers are  
acceptable. The blend is prepared such that the  
second nylon-type polymer is 2.5 to 10 mole percent of  
the overall blend composition.

- 20 The nylon blend compositions are conveniently made  
into useful products by any of the conventional  
fabrication processes. Seen as particularly  
advantageous are forms wherein the nylon is shaped  
into a packaging film such as by extrusion or coextrusion.  
25 While a single layer film of the nylon blend may be

conveniently formed as by extrusion, it is anticipated, and the applicants' experience has shown, that a preferred film is a multiple-layer film formed e.g. by coextrusion of a layer of the nylon blend with other 5 layers which serve other and specific purposes. Functionally acceptable, multiple layer films within the teaching of this invention may be made by other methods. For example, the nylon blend composition may be formed into a single layer film and subsequently 10 laminated, e.g. by adhesive or extrusion lamination, to other separately formed layers, or may be extrusion coated or coextrusion coated to form a multiple layer film. Because of the beneficial economics of coextrusion, the description herein is directed to that 15 process. While certain process benefits are seen in the coextrusion of nylon blend films of the invention, other advantages of the films of the invention are related to the functional performances of the film as part of a package. Thus, while the films of the 20 invention are advantageously formed by coextrusion, the emphasis herein on that illustrative process should not be construed as limiting the scope of the invention. Likewise, the nylon blend compositions herein may be fabricated, for example by molding, or by other 25 fabrication processes without departing from the scope of the invention contemplated.

- 11 -

Typical films of this invention are those shown in FIGURES 1, 1A, 2 and 2A. The overall film of FIGURE 1 is designated 10. Layer 12 is a heat sealable layer. Layer 14 is an adhesive layer. Layer 16 is 5 ethylene vinyl alcohol copolymer (EVOH). Layer 18 is the nylon blend layer. The film of FIGURE 1A, designated as 10A, is derived from the structure of FIGURE 1, and has layers of similar compositions numbered the same as those of FIGURE 1, but with the "A" suffix. Thus, 10 for example, layers 18 and 16 in FIGURE 1 have the same general families of compositions as layers 18A and 16A in FIGURE 1A, respectively. The difference between the structures of FIGURES 1 and 1A lies primarily with 15 the additional layer 19A, appearing in the FIGURE 1A structure. The primary purposes of layer 19A is to provide thickness to the structure at an economical cost. Typical materials for layer 19A are polyethylene or ethylene vinyl acetate copolymer (EVA). As further illustration of the scope of the invention, 20 layer 19A could serve any of a number of purposes, and may indeed comprise more than one layer entity.

With reference now to FIGURES 2 and 2A, it is seen that the overall films are designated 20 and 20A respectively. The individual layers in FIGURES 2 and 25 2A are identified by 20's series numbers, whereas the

layers in FIGURES 1 and 1A are identified by 10's series numbers. Layers having comparable compositions and functions are given the same final digit in the numbering. Thus layers 28, 28A, 18 and 18A all have 5 similar compositions. Likewise, layers 24, 24A, 14 and 14A all have similar compositions.

In FIGURE 2, an additional layer is added at 27, between layers 26 and 28. FIGURE 2A is derived from FIGURE 2. The difference between FIGURES 2 and 2A 10 resides in the additional layer 29A which is used for providing thickness to the film in the same way as layer 19A of film 10A of FIGURE 1A.

Layers 12, 12A, 22 and 22A are first surface layers on the exterior of their respective films and 15 are comprised of heat sealable polymer. Selection of materials which are acceptable for the heat seal layer is defined by the functional capability of the heat seal layer to perform its sealant function when forming a package, while functioning compatibly with 20 the other layers in the film. Performing the sealant function includes forming the heat seal and retaining the seal integrity and the package integrity for the duration of the expected life of the package. Known sealants include the various polyethylenes, polypropylenes, 25 and propylene and ethylene copolymers. Preferred

sealant layer compositions are Surlyn or EVA.

The second surface layer on the film, namely on the surface opposite the sealant layer, is the nylon blend composition. The nylon blend composition is

- 5 90 to 97.5 mole percent nylon 6 and 10 to 2.5 mole percent of a second nylon polymer, preferably nylon 66 or nylon 12. The composition of the nylon layer is conveniently obtained by blending a nylon 6 polymer with a copolymer of nylon such as nylon 6, 66 or
- 10 nylon 6, 12. Typical of these is a copolymer which is 85 mole percent nylon 6 and 15 mole percent nylon 66. Using the instant copolymer the range of 2.5% to 10% of the second nylon polymer, namely nylon 66, may be obtained within the parameters of blending nylon 6
- 15 and the nylon copolymer at weight ratios of approximately 5/1 to 1/2 nylon 6 to nylon copolymer. Other ratios can be developed for other copolymers.

- Alternatively the nylon composition may be obtained directly in the form of a copolymer, of
- 20 nylon 6 and the second nylon polymer, where the composition is 2.5 to 10 mole percent of the second nylon polymer and 97.5 to 90 mole percent nylon 6.

- An acceptable composition for the nylon layer would be, for example, a nylon 6, 66 copolymer having 90% to
- 25 97.5% moieties of nylon 6 and 10% to 2.5% nylon 66.

A third, barrier layer of EVOH 16, 16A, 26 and 26A is positioned between the first and second surface layers.

While the EVOH adheres to the nylon layer, it has poor adhesion to the olefinic type materials commonly used for the sealant layer. A fourth adhesive layer is disposed adjacent to the EVOH layer, between the EVOH and the sealant layer. Suitable adhesive polymers which are conventionally available and are known for adhesion to EVOH are typically ethylene or propylene polymers and copolymers. Exemplary of these adhesives are the anhydride modified polyethylenes and ethylene copolymers. Specific examples of modified adhesive polymers which may be used to adhere EVOH to a sealant layer of Surlyn are Plexar 158 and Plexar 3, from Chemplex Company, and CXA 3095 from DuPont Company.

Additionaly internal layers may be added to the film structure as desired, so long as the interlayer adhesion is adequate to keep the film structure intact throughout its useful life; and so long as the combination of functions of the other layers is preserved.

The films according to this invention are desirably used in the packaging of certain meats. In dealing with the environments of that family of packaged goods, a filled and sealed package may encounter high

- humidity environments which could at least temporarily reduce the oxygen barrier property of the EVOH layer if the moisture evidenced by the high humidity were to reach the EVOH layer. In order to prevent moisture from
- 5 reaching the EVOH layer and reducing its effective barrier property, a "fifth" or further moisture barrier layer may be disposed in the film between the EVOH layer and the nylon blend layer. Such a layer is represented by layers 27 and 27A in FIGURES 2 and 2A.
- 10 The composition of the fifth layer is such that it adheres well to the nylon and to the EVOH, as well as having the desired moisture barrier property. Polymers which meet these criteria and which are thus useful as the fifth layer are the well known anhydride modified polymer
- 15 adhesives which are based on polyethylene and polypropylene. The second and/or third layer could be modified for adhesion to the fifth layer, in which case the fifth layer need not necessarily be modified for adhesion-enhancing properties.
- 20 An additional or "sixth" layer can be incorporated, exemplified by layers 19A and 29A in FIGURES 1A and 2A respectively. In the structures contemplated by FIGURES 1A and 2A, layers 19A and 29A may be, for example, EVA. EVA adheres well to many
- 25 of the adhesive layer materials and to many of the

sealant layer materials; and its fabrication properties are conducive to its use with the other polymers in the film.

It should be understood that the fifth and sixth  
5 layers may each be used without the other, or may be used in combination.

The invention is further illustrated by the following specific, non-limiting Examples.

#### EXAMPLE 1

10 A nylon blend composition is made by blending equal parts by weight of nylon 6 and a nylon copolymer which is 85 mole percent nylon 6 and 15 mole percent nylon 66. Using multiple extruders and appropriate combining equipment, a four layer film is coextruded as  
15 is described for FIGURE 1. The adhesive layer 14 is Plexar 158. The sealant layer 12 is Surlyn ionomer from DuPont. Overall, the film is about 3.5 mils (0.089 mm) thick.

#### EXAMPLE 2

20 A film is made as in EXAMPLE 1 except that an additional layer as at 19A in FIGURE 1A is added. The additional layer is EVA and comprises 45% of the overall thickness of the film.

#### EXAMPLE 3

25 A nylon blend composition is made by the method

of EXAMPLE 1 and wherein the nylon 6 and the nylon 6, 66 copolymer are blended at the weight ratio of 65% nylon 6 / 35% nylon 6,66. Using multiple extruders and appropriate combining equipment, a five layer film is 5 coextruded as is described for FIGURE 2. The adhesive layer 24 and the moisture barrier layer 27 are both Plexar 158. The sealant layer is Surlyn.

#### EXAMPLE 4

A film is made as in EXAMPLE 3 except that an 10 additional layer corresponding to 29A in FIGURE 2A is added. The additional layer is EVA and comprises 30% of the overall thickness of the film.

The primary advantages of nylon 6 are related to its physical stability during fabrication processes 15 which rely on applications of heat to activate the film for fabrication. For example, heat sealing operations may be carried out over a relatively broad range of heat fluxes. Coupled with its heat stability, though, is a requirement that high temperatures be used for 20 fabricating nylon 6 into a film layer. Such high heat is required that, even when operating at the lowest processing temperatures acceptable for nylon 6, a temperature near the maximum temperature tolerable by EVOH is employed. Any fluctuation in die temperature, 25 even normal fluctuation, tends to be either too cold for

the nylon 6 to be properly fabricated or to be so hot that it tends to degrade the EVOH.

- The primary advantages of nylon copolymer such as nylon 6, 66 or nylon 6, 12 is that it can be
- 5    fabricated at a temperature of about 410° to 450°F  
(210 to 232°C) which is compatible with the fabrication of the other layers in the films described. Indeed a multiple layer film using 10 - 20 mole percent nylon 66 is described by JP-A-58/74,313. However, a
- 10    film using 15 mole percent nylon 66 has too limited a heat resistance for packages to be fabricated by heat sealing techniques. Such packages exhibit a high incidence of holes which are burned through the packaging film during the heat sealing operation.
- 15    There is also a tendency for the nylon copolymer to soften and adhere to the sealing bar, causing mal-functions of the packaging machinery.
- As regards thermoforming, it has been unexpectedly found that films according to the present
- 20    invention have a substantially increased range of heat settings which are acceptable for thermoforming on a given piece of equipment. FIGURE 3 illustrates the ranges of heat settings which can be used for thermoforming films of the invention as compared to
- 25    films composed either of nylon 6 entirely or of

10% to 20% nylon 66. Comparative potentiometer settings in the range of 6 - 10 are highly satisfactory, and work well for thermoforming with nylon 6. Obtaining the nylon 6 multiple layer film by coextrusion is a  
5 problem, however, as iterated above, because of its high film formation temperature.

FIGURE 3 represents a series of tests for thermoforming films under constant conditions except for changes in the potentiometer heat setting. It  
10 shows that films using 10% to 20% nylon 66 can tolerate potentiometer settings only up to 6 on the same equipment and at otherwise the same operation conditions. By observation, it has been found that potentiometer settings greater than 6 yield non-  
15 uniformity in the thermoformed packages. Settings in the range of 5 - 6 can yield good package uniformity if the potentiometer output can be controlled closely enough. As a practical matter, potentiometers used in commercial thermoforming operations do not have the  
20 close control of heat output required for use of nylon 6, 66 having 10% to 20% of the nylon 66 component by weight.

FIGURE 3 also shows that the films of the invention, surprisingly are adequately softened for  
25 thermoforming, and can be thermoformed into commercially

acceptable packages, under the same operating conditions at potentiometer settings ranging from 4 to 10. Essentially, our nylon compositions, having reduced content of the second nylon polymer, as 5 compared to known nylon polymer compositions, exhibit an unexpectedly expanded range of acceptable heat settings, which surprisingly encompasses essentially the entirety of the ranges of the component parts of the blend.

10 In a companion development, it is seen that the films of the invention exhibit heat tolerance similar to that exhibited by nylon 6 during heat sealing operations while also exhibiting the lower temperature film fabricating properties of films 15 using 10% to 20% nylon copolymer in the nylon layer.

It is seen from the above that the heart of the invention resides in a polymer which comprises 90 to 97.5 mole percent nylon 6 and 10 to 2.5 mole percent of a second nylon polymer. By adhering a film 20 layer of the nylon polymer to a film layer of a heat sealing layer, the multiple layer film has general utility as a heat sealable film. By interposing a barrier layer and selected intermediate layers between the nylon layer and the heat seal layer, various other 25 properties may be readily imparted to the film without

departing from the principles and the advantages  
of the nylon layer.

Films of this invention may conveniently be  
made in a thickness range of 2 - 9 mils (0.051 -  
5 0.23 mm). While thicker films are not usually  
economically justified, they are contemplated as  
being operable.

## Claims:

1. A composition of matter comprising nylon 6 in combination with another nylon, characterised in that the composition is either a blend of:
  - 5 (a) 40% to 75% by weight nylon 6; and
  - (b) 60% to 25% by weight of a nylon copolymer which consists of 80% to 90% moieties of a first, nylon 6 polymer and 20% to 10% moieties of a second nylon polymer
- 10 the overall composition of the blend comprising 2.5% to 10% moieties of the said second nylon polymer, or is a copolymer of nylon 6 and another nylon polymer, the latter being present in an amount of 2.5 to 10%.
- 15 2. A composition according to claim 1, wherein the overall composition comprises 5% to 7.5% moieties of the second nylon polymer.
- 20 3. A composition according to claim 1 or claim 2, wherein the second nylon polymer is nylon 66 or nylon 12.
4. A plastics film formed from the composition according to claim 1, 2 or 3.
- 25 5. A multiple layer film characterised by having a heat sealable layer on one surface thereof and a nylon layer on the opposite surface thereof,

the said nylon layer being a blend composition according to claim 1, 2 or 3.

6. A film according to claim 5, characterised by including a functionally adhesive polymer layer 5 between the heat sealable and nylon layers.

7. A multiple layer heat sealable film comprising (a) a first, heat sealable layer on one surface of the film; (b) a second, nylon layer on the other surface of the film; (c) a layer of ethylene 10 vinyl alcohol copolymer between the first and second layers; and (d) a fourth, adhesive layer between the first and third layers, the said second layer comprising a blend of nylon polymer and nylon copolymer, in which blend 40% to 75% by weight 15 being nylon 6 and 60% to 25% by weight being a nylon copolymer, the copolymer being 80% to 90% moieties of a first, nylon 6 polymer and 20% to 10% moieties of a second nylon polymer, the overall 20 composition of said blend comprising 2.5% to 10% moieties of said second polymer of nylon.

8. A film according to claim 7, characterised by the second nylon polymer comprising nylon 66 or nylon 12.

9. A film according to claim 7 or claim 8, 25 characterised further by including a layer of

polyethylene or polypropylene between the said second and third layers.

10. A film according to claim 7, 8 or 9,  
characterised further by including a layer of a polymer  
5 or copolymer of a polypropylene or polyethylene  
between the said first and fourth layers.

11. A film according to any of claims 7 to 10,  
characterised in that the said second nylon polymer  
comprises nylon 66 and is present as 5.0% to 5.5%  
10 of the overall blend composition of the said second  
layer.

12. A film according to any of claims 7 to 10,  
characterised in that the said second nylon polymer  
comprises nylon 66 and is present as 7.25% to 7.75%  
15 of the overall blend composition of the said second  
layer.

13. A film according to any of claims 7 to 12,  
characterised in that the said fourth layer is an  
adhesive based on an ethylene polymer or copolymer.

20 14. A film according to claim 9 or any  
claim dependent on claim 9, characterised in that the  
said first layer comprises Surlyn; the second  
layer is a blend of equal parts by weight of nylon 6  
and a copolymer of nylon 6, 66, said copolymer  
25 comprising 85 mole percent nylon 6 and 15 mole percent

nylon 66, and the fifth layer comprises a low density polyethylene adhesive.

15. A film according to claim 10 or any claim dependent on claim 10, characterised in that the composition of the sixth layer is chosen from low density polyethylene and ethylene vinyl acetate copolymer.

16. A film according to claim 15, characterised in that the composition of the second layer is a blend of about 65% by weight nylon 6 and 35% by weight of 10 a copolymer of nylon, said copolymer being about 85 mole percent nylon 6 and 15 mole percent nylon 66, and wherein the composition of the first layer comprises Surlyn.

17. A package, including a containing packaging 15 film and a moist product therein, the package being suitable for use in a moist environment, and being susceptible of being closed by heat sealing, characterised in that the packaging film has a first, heat sealable surface layer on that surface of the 20 film disposed toward the interior of the package and a second, nylon surface layer on the surface of the film disposed toward the exterior of the package, the film further having a third layer of ethylene vinyl alcohol copolymer between the first and second layers, 25 and a fourth layer of ethylene polymer or copolymer

between the first and third layers, and wherein the said second layer comprises a blend of 40% to 75% by weight nylon 6, and 60% to 25% by weight of a nylon copolymer wherein the copolymer is 80% to 90% 5 moieties of nylon 6 and 20% to 10% moieties of a second nylon polymer; the overall composition of the blend comprising 2.5% to 10% moieties of the second nylon polymer.

18. A package according to claim 17 further 10 characterised by a fifth layer comprising polyethylene or polypropylene disposed between the second and third layers.

19. A package according to claim 17 or claim 18, characterised in that the overall composition 15 of the second layer comprises 5% to 7.5% of said second nylon polymer.

20. A package according to claim 17, 18 or 19, characterised in that the said second nylon polymer is chosen from nylon 66 and nylon 12.

21. A package according to claim 17, characterised by including a layer of a polymer or copolymer of polypropylene or polyethylene between the first and fourth layers.

22. A package according to claim 21, 25 characterised in that the overall composition of

the second layer comprises 5.0% to 5.5% nylon 66.

23. A package according to claim 21 characterised in that the overall composition of the second layer comprises 7.25% to 7.75% nylon 66.

5 24. A package according to any of claims 21 to 23, characterised in that the composition of the sixth layer is chosen from low density polyethylene and ethylene vinyl acetate copolymer.

10 25. A package according to any of claims 17 to 24, characterised in that the first layer comprises Surlyn, and the second layer comprises a blend of about 65% by weight nylon 6 and 35% by weight of a copolymer of nylon, the copolymer being about 85 mole percent nylon 6 and 15 mole percent nylon 66.

15 26. A package according to claim 18 or any claim dependent thereon, characterised in that the first layer comprises Surlyn; the second layer is a blend of equal parts by weight of nylon 6 and a copolymer of nylon 6,66, the said copolymer comprising 85 mole percent nylon 6 and 15 mole percent nylon 66, and the fifth layer comprises a low density polyethylene adhesive.

20 27. A film comprising a first, heat sealable layer on one surface thereof and a second, nylon 25 layer on the other surface thereof, and wherein the

composition of the nylon layer is 90 to 97.5 mole percent nylon 6 and 10 to 2.5 mole percent of a second polymer of nylon, for example 92.5 to 95 mole percent nylon 6 and 7.5 to 5 mole percent of the second 5 nylon polymer.

28. A film according to claim 27 wherein the second nylon polymer is chosen from nylon 66 and nylon 12.

29. A film according to claim 27 or claim 28, 10 further characterised by a third polymeric layer comprising ethylene vinyl alcohol copolymer between the first and second layers and by a fourth adhesive layer between the first and third layers.

30. A film according to claim 27, 15 characterised in that the composition of the first layer is Surlyn, the composition of the second, nylon layer is 92.25 to 92.75 mole percent nylon 6 and 7.75 to 7.25 mole percent of the second nylon polymer, and the film further comprising a third layer 20 of ethylene vinyl alcohol copolymer, a fourth, adhesive layer between the first and third layers, the adhesive fourth layer being based on a polymer chosen from ethylene vinyl acetate copolymer and low density polyethylene; and a fifth layer between the 25 second and third layers, the fifth layer being based

on a polymer chosen from polyethylene and polypropylene.

31. A film according to claim 30, characterised in that the adhesive fourth layer is based on 5 ethylene vinyl acetate copolymer and the fifth layer is based on a low density polyethylene.

32. A film according to claim 27, characterised in that the composition of the first layer is Surlyn, the composition of the second, nylon layer is 94.5 10 to 95 mole percent nylon 6 and 5 to 5.5 mole percent of the second nylon polymer, the film further comprising a fourth adhesive layer between said first and third layers, the said adhesive fourth layer being based on a polymer chosen from ethylene vinyl acetate 15 copolymer and low density polyethylene; and a sixth layer between the first and fourth layers, the sixth layer being a polymer or copolymer of polypropylene or polyethylene.

33. A film according to claim 32, characterised 20 in that the adhesive fourth layer is based on ethylene vinyl acetate copolymer and the sixth layer is based on an ethylene vinyl acetate.

34. A package, including a containing packaging film and a moist product therein, the package being 25 suitable for use in a moist environment, and being

susceptible of being closed by heat sealing,  
characterised in that the packaging film has a first,  
heat sealable surface layer on the surface of the  
film disposed toward the interior of the package,  
5 a second surface layer of nylon on the surface of the  
film disposed toward the exterior of the package,  
a third layer of ethylene vinyl alcohol copolymer  
between said first and second layers, and a fourth  
layer of an adhesive comprising an ethylene polymer  
10 or copolymer between the first and third layers; the  
second layer comprising 90 to 97.5 mole percent nylon 6  
and 10 to 2.5 mole percent of a second nylon polymer.

35. A package according to claim 34  
characterised in that the composition of the first  
15 layer is Surlyn, the composition of the second  
layer is 92.25 to 92.75 mole percent nylon 6 and  
7.75 to 7.25 mole percent nylon 66, and the composition  
of the fourth layer is based on ethylene vinyl acetate,  
the film further including a fifth layer based on low  
20 density polyethylene between said second and third  
layers.

36. A package according to claim 34,  
characterised in that the composition of the first  
layer is Surlyn, the composition of said second  
25 layer is 94.5 to 95 mole percent nylon 6 and 5 to 5.5

- 31 -

mole percent nylon 66, and the composition of the fourth layer is based on ethylene vinyl acetate, the film further including a sixth layer between the first and fourth layers which is based on ethylene  
5 vinyl acetate.

37. A composition of matter comprising nylon 6 in combination with another nylon, characterised in that the composition is a copolymer of nylon 6 and the other nylon, the latter being present in an amount  
10 of 2.5 to 10 mole percent.

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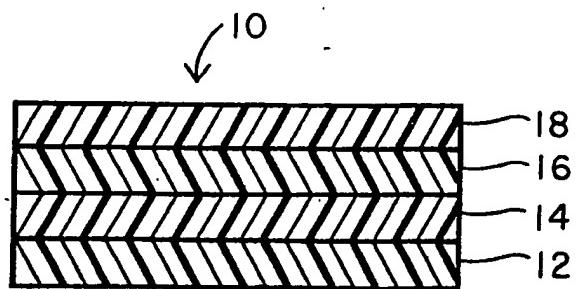


FIG. I

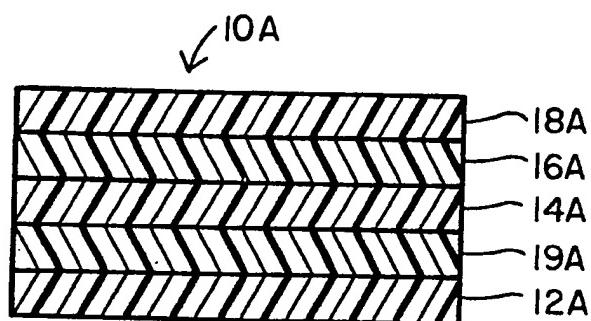


FIG. IA

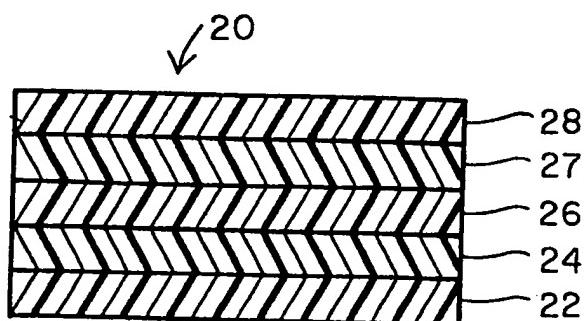


FIG. 2

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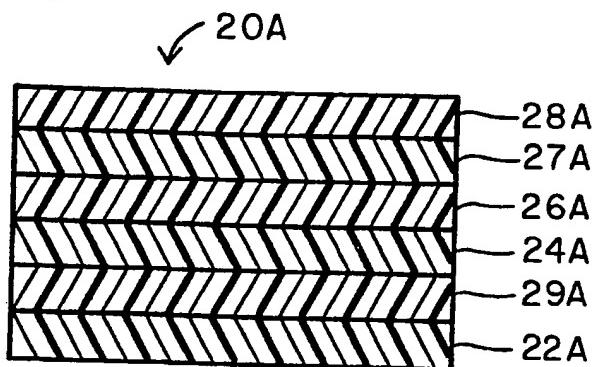


FIG. 2A

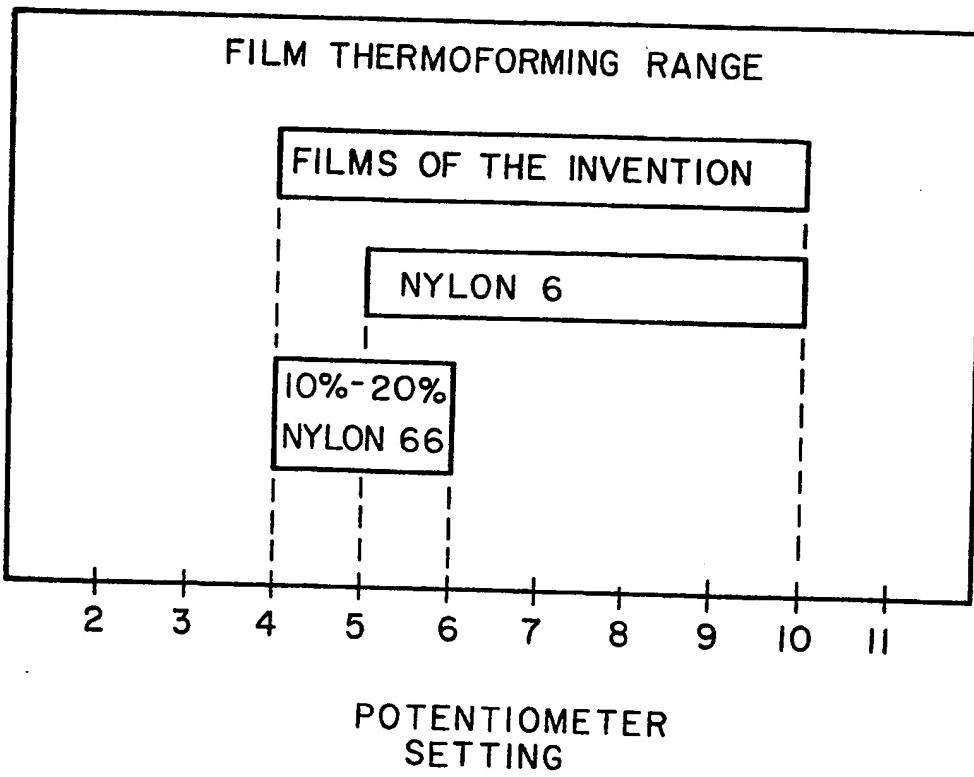


FIG. 3



European Patent  
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## EUROPEAN SEARCH REPORT

**0170385**  
Application number

EP 85 30 4368

### DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
Y	US-A-4 361 628 (D.A. KRUEGER et al.) * Column 1, line 67 - column 2, line 11; claims *	1-37	C 08 L 77/02 B 32 B 27/08 B 65 D 75/26
Y	FR-A-2 285 231 (TOPPAN PRINTING) * Examples; claims *	1-37	
Y	EP-A-0 062 822 (WOLFF WALSRODE) * Page 1, line 18 - page 2, line 19; claims *	1-37	
Y	GB-A-2 006 108 (TOYO SEIKAN) * Page 1, line 50 - page 2, line 41 *	1-37	
	-----		TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
			C 08 L B 32 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14-10-1985	LEROY ALAIN

#### CATEGORY OF CITED DOCUMENTS

- X : particularly relevant if taken alone
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